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Communal cattle production in Zimbabwe: A review

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Abstract

Development of communal cattle production can be a sustainable way to improve the livelihoods of the rural population in Zimbabwe. There is however, little information and research conducted to characterize, understand and develop the communal cattle production systems in Zimbabwe. This review focuses on the importance of communal cattle production, constraints to sustainable production and research needs necessary to improve the production systems.

Communal cattle production in Zimbabwe is extensive and dominated by indigenous cattle which are adaptable to the local environment. Their important functions, which include provision of food security and socio-cultural role, are discussed. The major constraints identified are high disease and parasite prevalence, low level of management, limited dry season forage availability and poor marketing management. Any improvement in these constraints may lead to a sustainable increase in communal cattle production.

Key words: *cattle characterisation, indigenous cattle, production systems*

Introduction

The cattle population in Zimbabwe is estimated to be between 4-5 million (Mashoko et al 2007), with 89 % of the herd found in communal areas (Mavedzenge et al 2006; Ndebele et al 2007). A larger proportion of the cattle population (3.5 million) found in the communal area (Assan 2012) are mainly of indigenous breeds with an estimated 88% of households owning indigenous cattle (Ndebele et al 2007) or crossbreds of predominantly indigenous blood. A greater proportion of exotic breeds are in the commercial sector (Mavedzenge et al 2006; Food and Agricultural Organisation (FAO) 2006; Mpofu 2002) where indigenous breeds are considered unproductive due to their small frame (Francis and Sibanda 2001). This perception is not true given the multipurpose roles and level of investment characterising the communal production system. A

number of indigenous breeds' advantages have been cited by many authors. Their superior genetic traits include their hardiness (Khombe 2002), high fertility (Mpofu 2002), high tolerance to diseases (Assan 2012), tolerance to heat and low feed requirement (Moyo 1995). In addition, meat from indigenous cattle is leaner containing less fat compared to meat from most exotic breeds (Muchenje et al 2008; Mpofu 2002). Assan (2012) hypothesised that economic returns of communal cattle production could actually, be higher than in commercial production systems due to their multipurpose nature. This review discusses the importance of cattle in communal areas, cattle production systems, breeds kept and constraints faced by cattle farmers in communal areas of Zimbabwe. It also discusses practical methods that can be used to improve communal cattle production in Zimbabwe.

Importance of cattle production in communal areas

Communal cattle fulfil multiple roles that include milk, manure (Masikati 2010; Ndlovu et al 2004; Khombe 2002), draught power (Chimonyo et al 1999), serve as an indication of one's wealth status (Maburutse et al 2012) and provision of meat and hides as terminal products (Mavedzenge et al 2006). Cattle hides are used to make drums, tents and mats, (Musemwa et al 2009; Mapiye et al 2006). A survey by Ndebele et al (2007) in Matabeleland revealed that cattle are used as investments and a status symbol. Cattle, thus, generate income among communal households through sales of the animals and their products. Improvement in cattle production and innovative value addition of cattle can create employment for people as individuals are hired to process and sell cattle and their products at various points of the production chain. Cattle play a pivotal role in socio-cultural function such as *lobola* payments and appeasement of ancestors (Maburutse et al 2012). They are also useful in nutrient recycling in communal rangelands (Tessema et al 2011). Cattle can also be exchanged or loaned to neighbours to enhance kinship ties (Mavedzenge et al 2006). However, the actual contribution of cattle at household level is not well known because the current valuation systems rely on monetary standards which ignore the nonmonetary contribution of cattle to households such as provision of manure, drought power and milk (Chimonyo et al 2000). Information on the real contribution of livestock to human food security and livelihoods is scarce (Gwaze et al 2009). It is therefore imperative for agro-economists to come up with indexes which incorporate non monetary contributions when valuing cattle's contribution to communal livelihoods.

Cattle population and distribution in communal areas

In Zimbabwe, cattle are the most important livestock species followed by goats. This is the trend in most countries in Southern Africa (Maburutse et al 2012; van Rooyen 2007; Mashoko et al 2007). The cattle population and proportions found in different agro-ecological regions of Zimbabwe communal areas are shown in Table 1. With 89% of the cattle in Zimbabwe in the smallholder sector (Table 1) and around 25% of GDP coming from livestock sector (FAO 2006), more resources should be channelled to communal cattle development programmes in order to redress national food security.

Table 1: Cattle population and distribution in Zimbabwe communal areas

Province	Ecological Region	Population	Proportion (%)
Manicaland	I	700 000	13.1
Mashonaland East	II	800 000	15.0
Mashonaland Central	II	500 000	9.4
Mashonaland West	II; III	550 000	10.2

Midlands	III; IV	650 000	12.2
Masvingo	IV	1 000 000	18.7
Matabeleland North	V	550 000	10.2
Matabeleland South	V	600 000	11.2

Source: Nyathi (2008a)

Cattle breeds in communal area

Some of the breeds found in Zimbabwe communal areas include the Brahman, Afrikander, Nguni, Tuli, Hereford, Simmental, Mashona and non descript crossbreds (Mashoko et al 2002). The Nkone, Tuli and Mashona are regarded as indigenous to Zimbabwe (Mpofu 2002). Indigenous cattle are valuable reservoirs of genes for adaptive and economic traits (Assan 2012; Khombe 1995; Moyo 1995), in providing diversified genetic pool, which can help in meeting future challenges resulting from possible changes in climatic conditions, production dynamics and consumer requirements (Masikati 2010, Musemwa et al 2009). An investigation by Ndebele et al (2007) revealed that indigenous cattle breeds are better able to utilise low quality feeds and can walk for longer distances, in search for water and feed during the dry period of the year when compared to the imported breeds. It is ideal that such breeds be utilised (Swanepoel and Setshwaelo 1997) in the communal areas which are characterised by highly variable spatiotemporal availability of feed (Mashoko et al 2007). Table 2 summarises characteristics of indigenous cattle breeds found in Zimbabwe.

Table 2: Characteristics of indigenous cattle breeds found in Zimbabwe

Breed	Distinctive traits	Sources
Mashona	-black/red mostly poled -compact body conformation -long tail that touches the ground - mature weight of 275 to 350 kg	Assan 2012 Kombe 2002
Tuli	-golden-brown/yellow(also found in red, white colours -males mature weight of 770 to 820 kg an - females mature weight of 500 to 550 kg	Mason and Maule 1960 Tuli Cattle Society of Zimbabwe 1995
Nguni	-short haired, glossy red and white coat well pigmented skin - mature bull weight of 430 to 680kg -mature cow weight of 225 to 450	Assan 2012 Moyo 1991

The adaptation of the local cattle breeds to the local production conditions is usually confounded by the low standard of management under which indigenous livestock are normally kept (FAO 2006). Studies have shown that when indigenous breeds are compared to exotic breeds raised under communal rangeland conditions, they outperform exotic breeds in terms of fertility, survival and yield traits (Mpofu 2002; Tawonezvi 1988a; Tawonezvi 1988b). However further research is required to validate such a productivity indices on indigenous breeds at a large scale (Gwaze et al 2009).

Cattle management systems in Zimbabwe

In Zimbabwe, there are two contrasting grazing systems i.e. controlled grazing in commercial and uncontrolled grazing communal farming areas (Assan 2012). Commercial farms are privately owned, aimed at profit maximisation and specific production goals (e.g. meat or milk). Livestock are kept in paddocks, grazing is controlled and improved forage species are sometimes introduced. Rotational grazing is mostly practiced in commercial farms (Cousins 1988).

Cattle management systems and production in communal farming systems differ significantly with commercial systems. The reasons for keeping livestock are very diverse in communal systems (Mapiye et al 2006a). Herding of cattle is the most common method of cattle rearing in Zimbabwe. Cattle are herded during the day and penned at night. In cases where there is limited grazing land, all the cattle from the entire village may be considered as a single interbreeding flock with no attempts of controlling mating. Herds from different households of the same village, however, may graze separately where there are vast tracts of grazing land. Following crop harvesting, cattle herds are let loose to feed on crop residues until the beginning of the rainy season, when the cattle have to be herded. The low intake of poor quality feed often limits production (Mapiye et al 2006b). Communal cattle are rarely supplemented with commercial feeds or improved legume fodder resulting in low intake of poor quality feed, which often limits livestock productivity (Tavirimirwa et al 2012; Ngongoni et al 2007). Since feeding is restricted, cattle have little choice of feed, resulting in poor body condition and low weight gains and a higher predisposition of the animals to endoparasites (Mashoko et al 2007) during the dry season. Animals move much further away from the homesteads during exceptionally dry seasons depending on spatial distribution of forage patches and availability of water (Scoones 1992). Masikati (2010) and Maburutse et al (2012) reported that cattle travel distances of 14km and 10km to water points in Nkayi and Simbi respectively.

Constraints to cattle production in communal areas

Cattle productivity in Zimbabwe communal areas is faced with numerous challenges which may differ with agro-ecological regions (Nyathi 2008b). These challenges have to be clearly understood and ranked for sustainable cattle improvement and production. The main constraints include high prevalence of diseases and parasites (Mavedzenge et al 2006), low level of management (Mashoko et al 2007), and limited forage availability (Ngongoni et al 2007; Mapiye et al 2006) and poor marketing management (van Rooyen 2007).

Prevalence of diseases and parasites

Diseases and parasites are major constraints to communal cattle production and are endemic in most Zimbabwe communal areas (Ndebele et al 2007). The impact of endo-parasites is mainly high mortalities, dry season weight loss which reduce fertility through nutrition induced stress (Chimonyo et al 2000). Poor control of diseases has negative financial (Chawatama et al 2005) and productivity implications as 70% of calves are born during the dry season (Ngongoni et al 2006). Studies by Homann and van Rooyen (2007), and Masikati (2010) cited communal herd mortality rate as high as 18%, whilst Mavedzenge et al (2006) revealed that disease accounted for 60% of herd mortality for communal cattle in Masvingo district. The most common diseases reported by farmers are blackleg, heart-water, babesiosis, anthrax and anaplasmolisis (Masikati 2010; Mavedzenge et al 2006). The situation is worsened by the unavailability and high cost of drugs (Ndebele et al 2007) and inadequate veterinary officials (Chawatama et al 2005). For example, a survey by Mashoko et al (2006) has shown that most of the cattle farmers have poor access to veterinary extension services except for contact with the dip attendants during dipping days. Cattle are also susceptible to external parasites causing heartwater and massive economic loss to the country (Mavedzenge et al 2006).

Level of management

Although the indigenous cattle breeds are hardy, their growth performance is generally poor, partly as a result of high disease and parasite challenges and low plane of nutrition (Swanepoel and Setshwaelo 1997) characterising communal areas which are mostly found in marginal regions of Zimbabwe (Mapiye et al 2006a). Management factors which cause low cattle production include low use of improved technologies (vaccinating, dosing), poor nutrition of dams leading to low milk production (Ngongoni et al 2007), poor calf housing structures allowing the build-up of infective agents in dung during the rainy season and prevalence of contaminated water sources (Masikati 2010) causing scours. Also, use of uninformed ethno-veterinary medicines as most communal farmers are not able to purchase drugs or to engage government veterinary doctors as there is on average only one doctor per district.

Lack of controlled breeding in communal areas has caused inbreeding, which result in poor growth rates (Mashoko et al 2007) in cattle. There are no structured breeding systems and appropriate infrastructure such as paddocks and, therefore, cows and bulls of unknown genetic merit and bloodlines run together all year round (Ndebele et al 2007). Some traits used to measure reproductive performance of communal cattle are shown in Table 3. The poor reproductive performance (Table 3) indicates low management level in communal cattle production systems. Extremely uncharacteristically high mortality among calves and slow growth among those that survive are major constraints to cattle production in communal areas (Makoholi Research Institute 2012). Low conception rate is one of the major causes of economic loss to cattle farmers and is mainly due to low bulling ratio as most farmers do not own bulls (Mashoka et al 2007).

Table 3: Reproductive performance of cattle under communal management

Reproductive traits	Measure	SOURCE
Calving rate	22-30 %	Mavedzenge et al. 2006; Homann and van Rooyen 2007
Calving interval	>24 months	Muchenje et al. 2007; Chimonyo et al. 2000
Age at first calving	28-36 months	Mashoko et al 2007
Calf mortality	3-25%	Makoholi Research Institute, 2012

Spatio-temporal availability and quality of animal feed

Seasonal deficiency in feed quality and quantity particularly during the second half of the dry season is the major constraint to communal livestock production (Masikati 2010; Dube and Ndlovu 1994). The principal causes of the feed challenges stem from a combination of the following factors:

(i) Communal use of grazing land and fallow field with no defined responsibility for adequate management of the land.
(ii) Poor quality of grazing due to the poor soils, low rainfall and forage species characterising communal rangelands.
(iii) Insufficient and inefficient use of crop residue with strong emphasis on poor quality cereal stover
(iv) Recurrent droughts which affect veld forage temporal quantity aExtremely und quality and result in less crop residue to supplement animal feed.
(v) Pressure on land as farmers expand their crop fields and clear more land for human settlement.

Poor management of rangelands, inappropriate grazing management, rangeland fires also limit the availability of fodder (Tavirimirwa et al 2012) in the communal areas. Veld quality and availability is highly variable in the tropics with crude protein dropping below to 5% in dry mature tropical

grasses (Mtali 2011). In the sour veld, the highest crude protein values are recorded during the wet season.

The reduction in protein content of grasses and the increase in lignin content during winter reduce the overall digestibility of the grasses (Van Soest 1995). Information on the effect of seasonal changes on feed dynamics and management in communal areas is scarce, making it difficult to assess the efficiency of utilisation of communal rangelands

Marketing management

Livestock marketing, in most communal areas, is poor and characterised by absent or ill-functioning markets (van Rooyen 2007). A baseline study by the International Crop Research Institute in Semi Arid Tropics (ICRISAT) revealed, lack of organised marketing of cattle in Zimbabwe communal areas (Homann and Van Rooyen 2007). Communal farmers resort to the informal way of marketing their cattle where pricing is based on an arbitrary scale, with reference to visual assessment of the animal. Middlemen are the main buyers and purchase live animals from farmers for resale at cattle auction points and to abattoirs in towns often benefiting more than the farmers themselves (Mavedzenge et al 2006). Apart from selling to local butcheries, farmers do not have ready markets where they can take their animals to if they need to sell their animals therefore usually end up under pricing their animals in cases of emergencies (Homann and van Rooyen 2007).

Possible areas of research for improvement of cattle production in communal areas

Research is required to understand communal cattle production practices and develop viable strategies that use cattle as vehicles for communal development. Aspects that require investigation include generating accurate statistics on the contribution of cattle to household economy and food security (Chiduwa et al 2008), characterisation of cattle breeds at molecular level, to identify appropriate genetic sources (FAO 2006) and, more importantly, developing sustainable research programmes and development projects that appropriately address the challenges that communal farmers face.

Baseline surveys and participatory rural appraisals

Much of the work on cattle has been carried out under controlled conditions at research stations, which have a mandate to conduct research on sustainable livestock production and the results are usually inapplicable to communal production systems in rural areas (Mapiye et al 2006a; Mpofu 2002; Moyo et al 1996). It is, therefore, pertinent to determine and evaluate the performance and limitations of these communal cattle under the communal cattle production conditions. Assessment of existing cattle production systems is an important tool to inform researchers about the constraints that farmers face and the opportunities that exist within their production systems (Agrisystems 2000; Mhlanga et al 2000). It is important to acquire knowledge on traditional practices of cattle production through baseline surveys which involve retrieving information from cattle owners using questionnaires, focus group discussions and direct observations (Homann 2007). In any development effort, conducting participatory rural appraisals is crucial to ensure that the farmers, who are the ultimate beneficiaries of the technologies developed, actively participate (Nqeno et al 2010) and are therefore empowered in the process. Information on productivity of cattle over seasons can be captured through close monitoring of changes in herd sizes and productivity. Herd monitoring involves the participation of willing farmers and takes advantage of indigenous resources and knowledge whilst at the same time introducing new technologies (Gwaze et al 2009). Monitoring of head for more than five years is required to cover all seasons and to provide sufficient data for development of appropriate intervention strategies

(Chinogaramombe et al 2009). Aspects that should be monitored include calving weights, 200 day and 400 day body weights (through use of weigh belts or by setting up scales at dipping points), herd dynamics (i.e. entries and exits into the herd and the reasons involved), reproductive performance such as calving interval which is a measure of herd productivity (van Zyy et al 1992). Long-term monitoring of cattle herds dynamics enhances better perception of cattle roles at individual household level. The data can be easily captured through computerising or redesigning dip recording cards to include performance records which can then be retrieved from the veterinary department periodically.

Improving the production environment

The epidemiology, burdens and susceptibility to parasites and diseases in different classes and strains of livestock require research (Gwaze et al 2009). Mechanisms of resistance, tolerance or resilience of indigenous cattle and the probable development of immunity in imported and crossbred cattle should also be investigated. Parasites with huge impacts on growth and mortality, such as tapeworm, should be prioritised in the research efforts. Affordable ways of controlling parasites, such as the use of ethno-veterinary medicines should also be evaluated to comple thement the conventional control methods (FAO 2001) as they can provide low-cost health care for simple animal health issues (Matlebyane et al 2009). Effort should be put into tapping indigenous knowledge systems such as those which can be repackaged for use in an informed and regulated way by local farmers.

Socio-economic research is also required to identifying appropriate marketing channels, developing niche markets for indigenous cattle and their products. Development of markets is a sure incentive for the farmers to appreciate the need to improve levels of management (Namibia National Farmers' Union (NNFU) 2008), control diseases and parasites and improve nutrition levels. Agricultural economists are, therefore vital in identifying constraints and opportunities to cattle production in communal areas.

Characterisation of indigenous breeds

Inadequate description, classification and evaluation of cattle have resulted in a poor understanding of the potential of the three indigenous cattle breeds (Khombe 2002). Breed differences can be established through molecular taxonomic characterisation, which can, in turn, serve as a guide on decisions relating to conservation (Gwaze et al 2009) and improvement of these breeds. Attributes of each breed will have to be identified and evaluated, to develop appropriate and sustainable breeding programmes. Microsatellites and single nucleotide polymorphisms (SNP) can be used with ease in the studying of DNA sequence and variation (FAO 2007) and result in enormous selection response (Assan 2012). At Matopos Research Institute there is conservation of indigenous cattle breeds which were characterised based on region of origin i.e. Tuli breed, Nguni breed and the Afrikaner (developed in South Africa) cattle using conventional methods. There is need to conduct a study in communal areas, using modern technologies such as microsatellites in order to characterise cattle based on genetic diversity rather than region of origin since these animals may be genetically similar. In South Africa, microsatellites have been used to evaluate the genetic diversity among indigenous cattle and identify different cattle strains (Assan 2012).

Selection of individual cattle for breeding

To effectively design sustainable genetic improvement programmes, correct matching of genotypes with the prevailing and projected socio-economic and cultural environments should be considered (Mpofu 2002), breeding objectives should be clearly defined. Adaptive traits, such as resistance to diseases and parasites and their adaptation to extreme weather conditions (Khombe 2002; Ndebele et al 2007) and for traits of economic importance such as calving interval, age at puberty, age at first calving (Musemwa et al 2009) should emphasized to improve communal cattle production. Programmes that encourage farmers to keep records should be developed since records form the basis for genetic improvement. Regarding within-breed selection, realistic performance and pedigree recording, with active farmer participation need to be adopted so that breeders can use the records to help select superior animals. Indigenous breeds should be prioritised in selection of individual cattle for communal herd improvement. For example, Mpofu (2002) reported 74% calving rate for Mashona cows almost 20% higher than that of Sussex (56%), indicating the importance of selecting cattle before using them as breeding animals at communal level. Khombe (2002) reported that Mashona cattle were more resistant to ticks and had high calving and weaning rate under marginal environmental conditions characterising most communal areas when compared to some exotic breeds.

Crossbreeding

In livestock production, there are situations in which the ideal animal could be the intermediate between a indigenous breeds which are adapted to the local environment and big bodied exotic breeds (Gwaze et al 2009; Mashoko et al 2007) to exploit cattle breed complementarity and heterosis (Garwe et al. 2002). Imported cattle breeds have been crossed with indigenous breeds to combine the high productivity of exotic breeds with adaptive attributes of indigenous breeds in the smallholder dairy sector. Muchenje et al (2007) reported that there was an increase in milk production from Jersey × Nguni and Jersey × Tuli F_1 and F_2 crossbred cows reared under smallholder farming conditions at Matopos Research Institute. Khombe (2002) concluded that exotic breeds with higher growth potential can be used to upgrade growth performance of the indigenous cattle. Communal farmers prefer to cross Brahmans with indigenous breeds because they consider them to be adaptive and docile (Mashoko et al 2006). Most crossbreeding programmes, however, have lacked long-term strategies on how to maintain a suitable level of upgrading (Garwe et al 2007) and the indigenous genetic source (Assan 2012) due to uncontrolled breeding management characterising communal areas. This implies that it is important to use a terminal cross system where the progeny are designated for slaughter and cross bred dairy heifers are continuously supplied to communal dairy farmers.

Practical recommendations

Several realistic recommendations can be made to enhance cattle productivity in communal areas of Zimbabwe. The major aspects to be improved relate to feeding management (Mapiye et al 2006a), training of farmers (Senda 2008), breeding management of cattle (Ndebele et al 2007) and marketing management (Homann and van Rooyen 2007). In training of farmers it is crucial for a partnership between agriculture departments, non-governmental organisations, research institutions, universities and other stakeholders to actively engage the farmers (Nqeno et al 2011). The training of extension officers who will, in turn, train communal cattle farmers will go a long way in realising and exploiting the potential of cattle production. The training should target household members who are directly involved in cattle production for identification and quantification of problems (Nqeno et al 2010). Lessons can be learned from the goat forum initiative where various stakeholders pooled resources and trained communal farmers on commercialisation of goat production in Matabeleland province (Nyathi 2008b) to regularly supply goats of superior quality to the market. The farmers were provided a goat manual written in local vernacular (Senda 2008). Farmers should be trained on various aspects of

improving cattle productivity (nutritional, health and breeding management) in communal areas and developing their entrepreneurial skills. The beef breeding calendar which is freely supplied by Agrifoods, for example, should be mastered by all communal cattle farmers. Use of the breeding calendar have the potential to improve communal cattle production as it has been noted that the low level of cattle production is mostly affected by poor breeding management in communal areas (Ndebele et al 2007).

Feed and fodder interventions

Farmers should be encouraged to set up home based oil extraction units and use the cake as winter supplement from legume seeds such as sunflower and soya which has been proven to be effective supplements (Ngongoni et al 2006). Foggage and hay, made from high-quality grass and legumes, and agricultural crop residues such as soya bean and groundnut stover, should be used as winter supplements (Gwaze et al 2009) to reduce the dry season nutritional deficit. Farmers should be encouraged to use cheap technologies, such as urea treatment of crop residue, which can increase crude protein content from 3% to 14%, for supplementary cattle feeding (Masikati 2010) during the dry season. Hand bailing of foggage and stover storage technologies was successfully tested at Matopos Research Institute under simulated communal conditions (Manyuchi et al 1994).

Introduction of fodder banks which can be used to supplement cattle feed during the dry season should be practiced. Use of cultivated forages has been reported to improve land carrying capacities and cattle productivity (Mashoko et al 2007). Tavirimirwa et al (2012) indicated the potential of star grass in enhancing the stability of a production unit and increasing the carrying capacity of cattle in fallows which are abundant in Zimbabwe communal areas (Manzungu and Mtali 2012). Different pastures can be established in various areas with consideration of particular climatic and edaphic factors in the five natural eco-regions. Mapiye et al (2006a) and Mapiye et al (2006b) recommended use of forage grasses which include Napier grass (*Pennisetum purpureum*), star grass (*Cynodon nlemfluensis*) and forage legumes which include *Lablab purpureus* (Highworth) and *Stylosanthes scabra* respectively in the smallholder sector to improve livestock feed availability. Results from pennisetum hybrids trials conducted at Matopos Research Institute, Makoholi Research Institute and Grassland Research Institute produced evidence that pennisetum hybrids perform well in both high rainfall(>800 per annum) and low rainfall (<600mm per annum) areas (Manyawu 1999 and Mapiye et al 2006a). The forages can also be processed into silage (Mhere et al 2002).

Breeding

Inbreeding is a major limiting factor to communal cattle production (Ndebele et al 2007, Mhlanga 2000; Moyo 1993). Inbreeding which result from mating of closely related animal, is aggravated by the fact that there is uncontrolled breeding in communal areas and bulls stay for long periods in a herd before they are culled (Ndebele et al 2007; FAO 2006). Inbreeding can be reduced through government facilitated exchange of bulls between farmers from different villages or as discussed above, more sophisticated breed improvement techniques may be practised where management allows for it. These should include use of artificial insemination to introduce new desired genes as well as introduction of open nucleus or group breeding schemes at strategic communal centres to improve cattle productivity smallholder areas (Ndebele et al 2007, Khombe 2002). In neighbouring South Africa the government has successfully set up over one hundred open nucleus breeding sites in efforts to improve communal Nguni cattle production.

Regardless of important traits observed in indigenous cattle, the breeds are sidelined in efforts to improve communal cattle production in Zimbabwe (FAO 2006). Development agencies have given more emphasis on introducing exotic breeds in communal areas. Examples include the heifer international projct where exotic heifers were donated to farmers, the LIT cow- calf loan scheme where two farmers per ward were supplied with two exotic breeds as a strategy to increase the national herd size (Khombe 2002). Emphasis should be on developing the indigenous breeds as studies have shown that the big bodied exotic breeds have no advantage over local breeds as they require more feed (Mpofu 2002) and vaccine to maintain the breeds under semi arid condition. One way to rapidly increase the population of indigenous cattle in communal areas is through selection of superior indigenous bulls and keeping them at research stations where semen collection is done as well as by initiating artificial insemination (AI) and multiple ovulation embryo transfer (MOET) programmes in communal areas.

Marketing

Communal livestock marketing and policy structures in the country should be improved (Gwaze et al 2009; Homann and van Rooyen 2007) and communal cattle farmers should be encouraged to form co-operatives and pool their animals together prior to marketing (Homann 2007). The main challenge with the marketing of cattle in communal areas is to disseminate information on prices and market requirements. Provision of best bet prices for animals in better condition will motivate farmers to invest in improved animal feed and management technologies (Homman et al 2007). More formal markets, than are available, should be established and Cold Storage Company (CSC) should be utilised to levels it was prior to the year 2000 since the company have vast infrastructure which is lying idle (Mavedzenge et al 2006). Linking the farmers with buyers through workshops also enhances an understanding of the requirements expected of the farmers by the buyers (Homman et al 2007). The policy makers can learn from the South African government intervention in marketing Nguni cattle in communal South Africa. The project facilitates marketing and value addition of Nguni cattle products in the Eastern Cape Province. Various stakeholders were partnered to develop an abattoir, a meat processing area, a tannery, and a leather craft workshop Eastern Cape Development Corporation (ECBD, 2003).This project has embarked on various craft products from cattle skins which include hand-crafted 'organic' leather products to sell to the tourist market (Musemwa et al 2009), use of hides in exported Mercedes vehicles (Raats 2004) and the footwear industry. Provision of such appropriate marketing infrastructure and innovation technologies enhances and motivates the farmers to improve cattle productivity (Gwaze et al 2009) and adds value to communal cattle production.

Another initiative that could be adopted in Zimbabwe is that of the Meatco of Namibia. One of the main objectives of Meatco is to provide credit lines and source for new markets for communal livestock farmers under their contract (Namibia National Farmers' Union (NNFU) 2008). Members of this association export products such as deboned beef and tanned hides to the European market and South Africa (NNFU 2008). Communal farmers should be encouraged to register their cattle with the livestock identification trust (LIT) to help them source new lucrative markets for their cattle. This should be ease if there is some form of controlled breeding to help with pedigree identification.

Cattle condition and weight assessments

The Department of Research and Specialist Services (DR&SS) where indigenous breeds are kept (Assan 2012: Khombe 2002; Mpofu 2002) should develop cattle weigh belts for use by communal farmers. These should be specific to the small framed indigenous breeds and farmers can use them to estimate calving weights, weaning weight and 400 day weights which are necessary in breed improvement programmes. The data can then be captured by a focal person per ward such as a worker from the extension services; livestock production department as well as officials of the

veterinary services (dip attendants). Advantages of weigh belts include that they are cheap and are affordable to resource poor communal farmers compared to conventional/digital scales and farmers will not be short changed when they sell their animals via informal markets (NNFU 2008). Farmers can also use the weigh belts to estimate weights when they sell their cattle to avoid under pricing the animals.

Previous beef production manuals produced in Zimbabwe were targeted at the commercial sector therefore did not adequately address the specific needs of communal farmers in terms of feed technology, breeding management and proper utilisation of draught animal power. There should be effort to write a beef production manual packaged in a way understandable to the communal farmer. This should be led by DR&SS who have developed many technologies to improve the cattle productivity by the resource poor farmers but were lacking in information dissemination (Masikati 2010, Mapiye et al 2006a, Mapiye et al 2006b).

Agricultural curriculum adjustment

The current agriculture education curriculum in the country has since ceased to be relevant after the agriculture sector changed from commercial farming based to smallholder farming. A study by Mutambara et al (2013) revealed that the smallholder farming system increased to 92% while that of the commercial sector decreased to 8% after the land reform program. Livestock production models taught in tertiary education institutions' curriculum in the country are still inclined towards the commercial sector and are not in line to the smallholder sector production system that owns the bulk of the national herd. Technologies developed by agriculture researchers and services provided by extension personnel are irrelevant therefore curriculum realignment is a prerequisite for the improvement of livestock productivity in the smallholder sector (Assan 2013, Mutambara et al 2013).

Conclusion

- Productivity of cattle in communal areas is limited by several constraints that include high prevalence of diseases, poor reproductive performance, limited feed availability and poor marketing. It is, therefore, imperative to develop concerted, coordinated and comprehensive farmer training, research and development programmes to address these constraints.

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